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Reed W. Bailey, Director
FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE

Ogden, Utah February 1959

BIOLOGICAL EVALUATION OF MOUNTAIN PINE BEETLE INFESTATIONS IN THE CLEARWATER NATIONAL FOREST, IDAHO 1958

Archibald Tunnock, Jr., Entomologist

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Prepared by the
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Missoula, Montana

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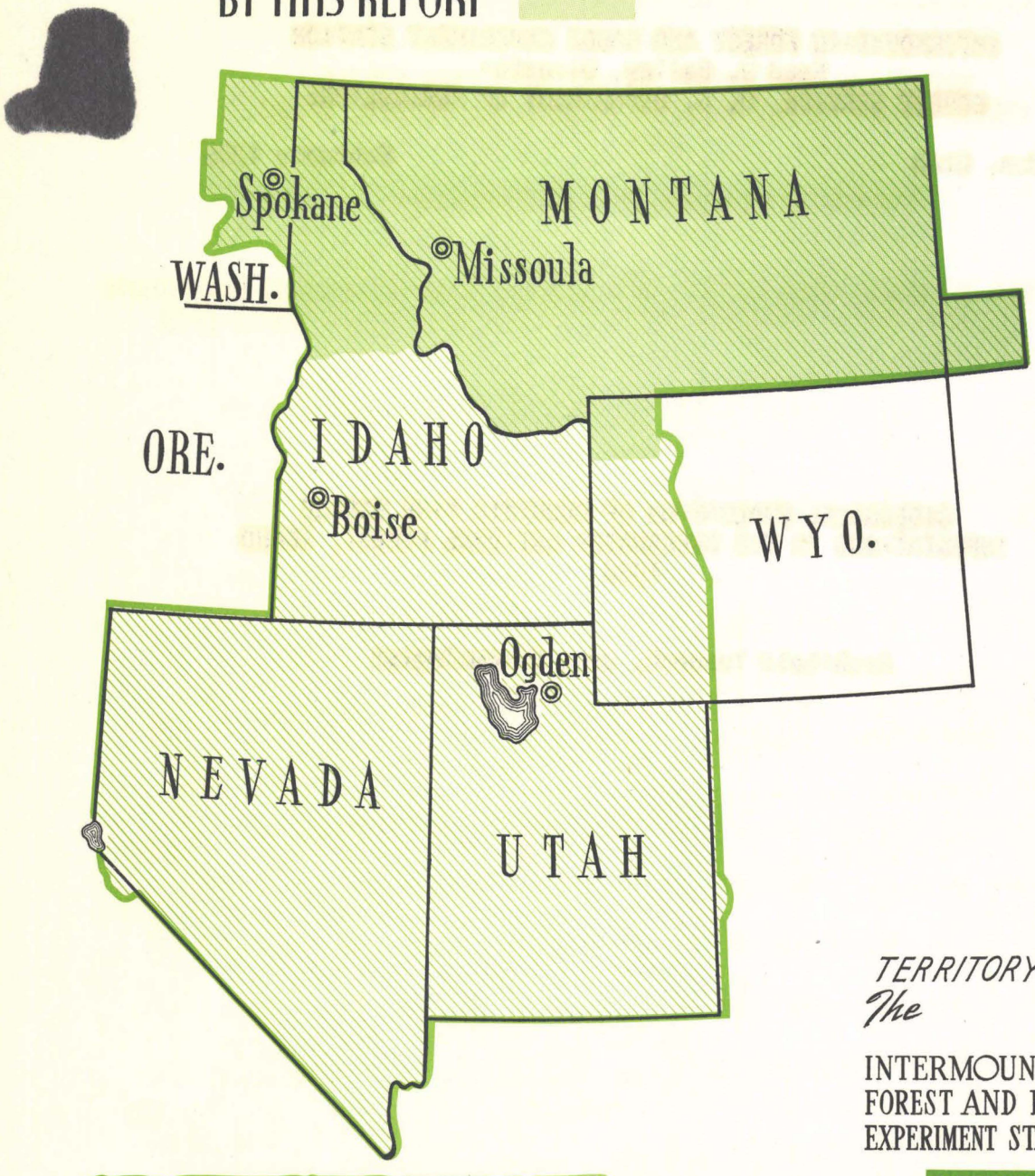

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INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION

The MISSOULA FOREST INSECT LABORATORY is a field unit of the Intermountain Forest and Range Experiment Station at Ogden, Utah. The Laboratory conducts forest insect research, surveys forest insect outbreaks, and gives technical advice on cooperative insect control programs in Montana, northwestern South Dakota, northwestern Wyoming, northern Idaho, and northeastern Washington.

The functions are conducted in the remaining station territory by staff entomologists at Ogden, and Boise, Idaho.

MAR

ERRATA

Please make the following correction in the publication "Biological Evaluation of Mountain Pine Beetle Infestations in the Clearwater National Forest, Idaho, 1953" by Archibald Tunnock, Jr., Entomologist:

Page 2, third paragraph, first sentence, should read - White pine blister rust surveys conducted by Forest Service employees indicated that about 50 to 60 percent of the white pines "in the nearby Skull and Quartz Creek drainages" on the Clearwater National Forest are lethally infested with C. ribicola.

Philip C. Johnson, Leader
Missoula Forest Insect Laboratory
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BIOLOGICAL EVALUATION OF MOUNTAIN PINE BEETLE INFESTATIONS IN THE CLEARWATER NATIONAL FOREST, IDAHO 1958

Archibald Tunnock, Jr., Entomologist

Since 1952 mountain pine beetle infestations have fluctuated moderately within the Clearwater National Forest, Idaho, in western white pine stands:

1952 -- 0.48 infested trees per acre were reported over a 27,000-acre area

1955 -- very light beetle populations were detected along Skull Creek

1957 -- results from an appraisal survey of 53,270 acres surrounding the Canyon and Bungalow Districts showed that 0.40 trees per acre were infested

During September 1958 the Missoula Forest Insect Laboratory made a ground biological evaluation of mountain pine beetle activity in the Clearwater River area in Idaho. The evaluation concentrated upon areas of active mountain pine beetle infestations first located by aerial means. All work was done in the Canyon and Bungalow Ranger Districts. The objects of the evaluation were to note current beetle damage and to gather biological data on the development of mountain pine beetle brood feeding on white pine trees. A biological index was determined from brood study counts to predict the infestation trend.

METHODS

Currently-attacked white pine trees were located by following a meandering course through areas of known infestations mapped from the air. All host trees encountered were recorded as either uninfested or infested by mountain pine beetles. Infested trees were further listed as uninjured or injured prior to attack. Injuries (as tabulated in table 1) were classified by two groups: diseases and mechanical. Types of injuries included top-kill by white pine blister rust, Cronartium ribicola Fischer, logging wounds, broken tops, lightning, etc. Injuries were noted to determine if the beetles are attracted to weakened or dying white pines. Mountain pine beetle brood was counted by developmental stages by removing, at breast height, 6- x 12-inch pieces of bark from four sides of an infested tree. Totals were kept of the number of attacks, eggs plus tiny larvae, medium larvae, large larvae, and pupae plus callow adults under the examined sections of each tree.

A formula developed by Bedard and Terrell[1/] was applied to the brood counts to compute a biological index for predicting mountain pine beetle infestation trends. A summary of the formula follows:

$$\frac{(B)\ 0.75}{A} \times V = \underline{\text{Biological index}} \text{ or } \underline{\text{ratio}} \text{ of increase or decrease of infested trees}$$

Key:

B = The amount of mountain pine beetle brood corrected for basal examination and anticipated mortality

0.75 = Constant correction for sex ratio and flight mortality

A = Attacks per square foot corrected for basal examinations (usually more attacks in base)

V = Value given infested tree on basis of whether it is average, below, above, or well above average size

RESULTS

A total of 5,506 white pine trees were examined within the Bungalow and Canyon Ranger Districts. Mountain pine beetles infested 104 or 1.9 percent of the examined trees. Table 2 tabulates infestation percentages according to areas evaluated and the predicted infestation potentials for 1959. An average biological index of 1.2 was obtained for the total area evaluated. The index assumes that for every tree attacked in 1958, 1.2 trees of that size will be attacked in 1959. This would be a 20 percent increase in the infestation.

White pine blister rust surveys conducted by Forest Service employees indicated that about 50 to 60 percent of the white pines on the Clearwater National Forest are lethally infected with C. ribicola. Table 1 explains that 44.2 percent of the infested trees injured prior to attack by the mountain pine beetle had tops killed by blister rust. Only 12.5 percent of the attacked trees were mechanically injured. A summary of studies in 1957 and 1958 show that little over 50 percent of the infested trees were injured before being attacked. A 50 percent figure does not seem significantly high enough to decisively indicate that mountain pine beetles prefer injured white pines, when the high incidence of blister rust in the beetle-infested area is taken into consideration.

1/ Bedard, W. O., and Terrell, T. T., 1939. A method for predicting the trend of mountain pine beetle infestations in western white pine. Unpublished report of the Coeur d'Alene Forest Insect Laboratory, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Coeur d'Alene, Idaho.

DISCUSSION

Since 1957 the mountain pine beetle infestation in the Clearwater River region has increased about threefold. In 1957, 0.47 percent of the white pine trees were infested, and in 1958 the percentage rose to 1.9. This increase in the infestation was close to the 1957 prediction when a 2.75 biological index was formulated. The index assumed that 1.3 percent of the stand would be infested in 1958. Past observations have witnessed periodic rises and falls of mountain pine beetle populations in surveyed areas. These population fluctuations are anticipated. Infestations are not expected to increase greatly in 1959 within the Canyon and Bungalow Districts. Logging of beetle-infested trees, where feasible, may aid in slowing down new infestations in 1959.

OBSERVATIONS

It was observed that a large percentage of parent adults seemed to lay below normal amounts of eggs. A collection of these low egg-producing beetles was examined by Dr. C. L. Massey of the Forest Insect and Disease Laboratory[2/], Albuquerque, New Mexico. Massey found that the beetles were infested with endoparasitic nematodes. Of the female beetles examined, 25 percent were infested with the nematode Aphelenchulus reversus Thorne, and 58 percent were infested with Parasitophelenchus sp. Massey replied that A. reversus was present in above normal numbers and is capable of seriously affecting egg laying of infested females. Little is known about the effects of Parasitophelenchus on its hosts. These nematodes were so abundant in individual specimens that they undoubtedly affected egg laying.

2/ Rocky Mountain Forest and Range Experiment Station

Table 1.--Percentage of infested white pine trees injured prior to attack by the mountain pine beetle, 1958

Area surveyed	Total number of infested trees	Uninjured trees		Injured trees			
				Mechanically*		Blister rust	
		Number	Percentage	Number	Percentage	Number	Percentage
Elbow Creek	4	-	-	2	50.0	2	50.0
Shake Creek	11	5	45.4	2	18.2	4	36.4
Knute Creek	9	6	66.6	2	22.2	1	11.1
Sheep Mt.(sw)	13	2	15.4	2	15.4	9	69.2
N. Canyon Face	45	17	37.8	2	4.4	26	57.8
Swanson Creek	11	7	63.6	2	18.2	2	18.2
Sneak Creek	11	8	72.7	1	.9	2	18.2
Total	104	45		13		46	
Average			43.3		12.5		44.2

* Trees injured by broken tops, logging, lightning, etc.

Table 2.--Biological evaluation of mountain pine beetle infestations within the Bungalow and Canyon Districts, 1958

Area surveyed	No. of noninfested white pine trees	No. of currently infested white pine trees	Percentage of infested trees	Biological index*
Elbow Creek	60	4	6.2	.8
Shake Creek	615	11	1.7	1.7
Knute Creek	1,052	9	.8	1.1
Sheep Mt. (sw)	475	13	2.7	1.7
N. Canyon Face	1,508	45	2.9	1.1
Swanson Creek	1,102	11	.9	1.4
Sneak Creek	590	11	1.8	.8
Total	5,402	104		
Average			1.9	1.2

* The biological index figure is a ratio of increase or decrease in the number of expected infested trees for the next year.